

of *Aphycus lounsburyi* Howard, and now parasitizes a large percentage of this *Aphycus* in certain localities.

An account of the introduction of *Quaylea* into California is given by Alexander Craw in his Horticultural Quarantine Report for the months of December, 1900 to April, 1901 (Eighth Biennial Report, State Board Horticulture, California, for 1901-2, pp. 196, 197, 1902). Craw calls the species *Hemencyrtus crawii*, a manuscript name given by Ashmead. I have seen one of the original specimens at Sacramento, Cal., determined by Craw as *Hemencyrtus crawii*, so that there is not any doubt about the identity of *crawii* and *Quaylea whittieri*.

I have also recently received a few specimens of this species from Dr. R. J. Tillyard, which were reared from *Saissetia oleae* at Sydney, New South Wales, by Mr. Luke Gallard.

Notes on the Identity and Habits of *Blepyrus insularis* Cameron (Hymenoptera, Chalcidoidea).

BY P. H. TIMBERLAKE.

(Presented at the meeting of December 1, 1921.)

The Encyrtid chalcid-fly described by Cameron under the name of *Encyrtus insularis* has been a puzzle to everyone who has attempted to identify the insect from the description alone, and it has consequently been described several times and referred to several incorrect genera.

For assistance in working out the synonymy of this parasite, I am much indebted to Dr. James Waterston of the Imperial Bureau of Entomology, who compared Hawaiian specimens with the type of *insularis* in the British Museum, and to Dr. R. C. L. Perkins for transmitting an old specimen which had been collected by Blackburn and retained by him as identical with the one sent to Cameron and described as *insularis*. This specimen, which is perfectly preserved, bears the No. 87. The actual type in the British Museum has fared worse, as Dr. Waterston reports that the antennae and abdomen have been lost. In regard to the comparison, Dr. Waterston writes

as follows: "I have compared them (i. e., the Hawaiian specimens forwarded under the name of *Blepyrus mexicanus*) with the torso of Cameron's type of *Encyrtus insularis*, and so far as I can see the two are identical."

Dr. Perkins in the Introduction to the Fauna Hawaiiensis (Vol. 1, Part 6, p. cvi, 1913) synonymized *Blepyrus marsdeni* Howard with *insularis*, but having failed to state his grounds for doing so, his action was not accepted by me in my former papers on Hawaiian Encyrtidae. It now appears that this synonymy was based on the Blackburn specimen mentioned above, and was of course correct.

GENERIC CHARACTERS OF BLEPYRUS HOWARD.

Female. Form short, compact; head thin, menisciform, somewhat wider than the thorax; eyes very large, vertical, continuous with the occipital margin above, finely, rather densely, and shortly pubescent; frontovertex moderately wide, or about one-fourth as wide as the head, abruptly widened behind the ocelli; the latter arranged in a large, nearly equilateral triangle, the posterior pair close to the eye margins, and about their own diameter from the occipital margin; cheeks short, or about one-fifth the length of the eyes; face with a semi-oval scrobal impression reaching upward between the eyes, the depths of the scrobes in the form of shallow grooves converging from the antennal sockets, but not meeting

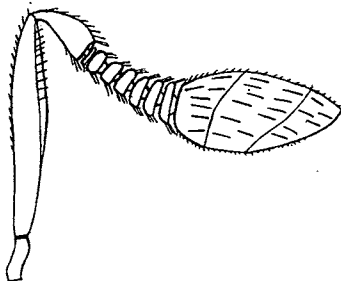


Fig. 1. *Blepyrus insularis*. Antenna of female.

above, the facial prominence between the antennae broad and low.

Antennae inserted rather far apart close to the clypeal margin, short and strongly clavate; scape slender, cylindrical, reaching nearly to the middle of the eyes and distinctly beyond the scrobal impression, pedicel a little longer than the first three funicle joints combined, the apical stalk connecting with the funicle very strongly capitate at its apex, forming a distinct but false ring-joint; funicle joints all short and transverse, the sixth over twice as wide as long; club very large, irregularly

oval, about as long as the pedicel and funicle combined, and much wider than the last funicle joint.

Mandibles narrow at apex, very unequally tridentate, the middle tooth much the longest, the inner tooth inserted much farther toward the base than the outer or ventral tooth; the base of the mandible rather wide and expanded in a plane at right angles with the plane of the apex. Palpi short, the maxillary pair with four joints, the two middle joints stoutest and only a little longer than thick, the basal joint nearly twice as long, and the apical joint about three times as long; labial pair with three joints, the middle joint hardly longer than wide, the apical joint about three times as long as thick, the basal joint a little shorter; labrum rather prominent, its apical margin transverse and ciliated with a row of fine hairs.

Thorax very robust and of great depth dorso-ventrally, the mesonotum strongly convex; pronotum almost vertical, the collar very short; mesoscutum about twice as wide as long, its posterior margin trisinate, the median lobe of the sinuosity much the widest and overlapping, when in normal position, the inner angles of the axillae; the latter, therefore, often appearing slightly separated but actually meeting; scutellum slightly longer than the mesoscutum, rather acute at apex, the disc somewhat depressed towards the base, more rounded towards the sides and apex, which are moderately elevated and abruptly declivous at the margins; propodeum short and nearly of equal length at the sides and middle.

Wings of moderate size, the disc beyond the speculum densely ciliated; the costal cell nearly as densely ciliated; the basal part of disc more sparsely ciliated with longer setae, the row of setae guarding the proximal margin of the speculum much longer than the others; marginal fringe short throughout. Marginal vein between two and three times as long as thick; the stigmal rather long, or about thrice as long as the marginal, nearly straight but with the apex curved slightly towards the costal margin; postmarginal vein nearly a half longer than the stigmal.

Legs of about normal length and structure; middle tibiae somewhat enlarged at apex and with a row of about nine peg-shaped spines on the outer, apical margin, the spur stout and nearly as long as the first tarsal joint; middle tarsi rather stout and tapering to apex, the basal joint about equal to the next three joints combined, the plantar surface of the first four joints provided with numerous peg-shaped spines similar to those on the tarsi of *Eupelmus*; hind tibiae with two short unequal apical spurs; hind tarsi somewhat longer and slenderer than the middle pair, and without the conical spines on the plantar surface.

Abdomen a little shorter than the thorax, triquetrous in shape, the apex bluntly rounded, the dorsal surface, when not distorted, much depressed and only slightly hollowed behind the first tergite, the venter moderately compressed, the ovipositor entirely enclosed by the ventrites; cerci or vibrissal plates situated on each side of the dorsum just before the middle, the vibrissae reaching nearly to the apex of the abdomen.

Frontovertex with shallow, more or less confluent, thimble-like punc-

tures of considerable size, but nevertheless much smaller than the diameter of the ocelli; the scrobal impression of face smoothish, but with fine transverse lineolations; mesoseutum extremely finely reticulate and with numerous seriatly arranged setiferous punctures; axillae and scutellum more opaque, being microscopically rugulose and with punctures like those of the scutum, the scutellum, however, becoming smoother and reticulate at apex; abdomen highly polished and with fine scale-like reticulations.

Pubescence on head and thorax rather thick, but not conspicuous because of its non-contrasting color, short and nearly erect on the fronto-vertex, larger, coarser, denser and more decumbent on the mesonotum, the apical part of scutellum becoming nearly bare, but with a pair of longer bristles at apical margin; abdomen nearly bare, but with a sparse fringe of moderately long, fine hair at the sides just below the lateral margins of the dorsum.

Blepyrus at present contains only a single species, as Ashmead's *phenacocci* is a typical species of *Chalcaspis* and must be cited in the future as *Chalcaspis phenacocci* (Ashmead). The genus evidently belongs to the Ectromatine group of genera notwithstanding the tridentate mandibles, as its relationship to *Pauridia*, *Aenasius*, *Chalcaspis*, *Zarhopalus*, etc., is apparent. Considered as a Mirine it is placed fairly well in Ashmead's tables, but *Coccophoctonus*, a synonym of *Blepyrus*, seems to be more accurately placed.

The following bibliography of *Blepyrus insularis* does not contain all the references to the species, but it is intended to include references to all new names and new combinations. The synonymy of *mexicanus*, *marsdeni*, *texanus*, and *dactylopii* was established through examinations of the types in the U. S. National Museum in 1917.

***Blepyrus insularis* (Cameron). Figures 1, 2.**

Encyrtus insularis Cameron, Mem. Manchester Lit. & Phil. Soc. (3) 10, 1886, p. 243, female (not male). Honolulu, Oahu.

Blepyrus mexicanus Howard, Proc. U. S. Nat. Mus. 21, 1898, p. 234, female (excluding male). Monterey, Mexico.

Blepyrus marsdeni Howard, l. c., p. 234, female. Honolulu, Oahu.

Blepyrus texanus Howard, l. c., p. 235, female. Brownsville, Texas.

Coccophoctonus dactylopii Ashmead, Proc. U. S. Nat. Mus. 22, 1900, p. 375, female (not male). Honolulu, Oahu (not Australia).

Bothriothorax insularis Ashmead, Fauna Hawaiiensis, 1, Part 3, 1901, p. 321, female (not male). Hawaiian Islands.

Blepyrus insularis Perkins, Fauna Hawaiiensis, 1, Part 6, 1913, p. cvi. Hawaiian Islands.

Blepyrus mexicanus Timberlake, Proc. Haw. Ent. Soc. 3, 1918, p. 403. Mexico, Texas, Hawaiian Islands.

Blepyrus mexicanus Timberlake, Proc. Haw. Ent. Soc. 4, 1919, p. 186. Mexico, Texas, Hawaiian Islands, Manila, Philippines, Java.

Bothriencyrtus insularis Timberlake, Proc. Haw. Ent. Soc. 4, 1919, p. 213. Hawaiian Islands.

The female of *insularis* should be easily recognized from the preceding generic description and from other characters given by Cameron, Howard and Ashmead, but the male has remained undescribed up to the present time. Cameron considered his specimen to be a male, but his description applies only to the female sex. Howard's supposed male of *Blepyrus mexicanus* clearly belongs to another genus, probably a new one allied to *Anagyrus*, and Ashmead's supposed males of *Coccophoctonus dactylopii* are merely small females.

The true male of *insularis* is very similar to the female in general appearance, and without close scrutiny might be mistaken for that sex; it differs, however, rather remarkably in the structure of the antennae, as the funicle is three-jointed and the club is correspondingly enlarged.

Male. Head somewhat smaller than in the female, less menisciform and thicker fronto-occipitally; eyes smaller and considerably wider in proportion to their length; frontovertex proportionately wider or somewhat less than one-third the total width of head, and less widened behind the ocelli, the latter arranged nearly in a right-angled triangle, the posterior pair less than half their own diameter from the occipital margin; face and cheeks nearly as in the female.

Antennae inserted close to the clypeal margin; scape much shorter

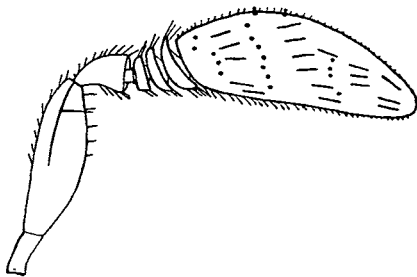


Fig. 2. *Blepyrus insularis*. Antenna of male.

and stouter than in the female, slightly widened in the middle, about one-half as long as the rest of the antennae and reaching only to the upper margin of the scrobal impression of the face; pedicel short and

stout, about a half longer than its apical thickness, but longer than the first two funicle joints combined, the false ring-joint seen in the female absent or greatly reduced; funicle with only three transverse joints, the third very short or over thrice as wide as long; club very large, solid, elongate oval in shape, its dorsal outline convex, but the ventral side straight, widest at the middle, where it is about one-third wider than the last funicle joint, and in length equal to about twice the pedicel and funicle combined.

Abdomen smaller than in the female, hardly more than one-half as long as the thorax, more acute at the apex, and usually strongly depressed above and beneath.

Other structural characters closely approximating those of the female sex, except that the frontovertex is much more opaque with finer, closer thimble-like punctures.

Coloration similar but not metallic, and with less yellow on antennae and legs, the head, thorax, and abdomen being black and only moderately shiny; antennae and legs fuscous to blackish, the apex of the front tibiae, apical half of middle tibiae, and front and middle tarsi brownish yellow, the hind tibiae slightly yellowish, the hind tarsi yellow beneath, and more or less fuscous above; wings hyaline and not distinctly stained with yellowish as in the female.

Length, (0.82 to) 1.23; length of head, 0.497; width of head, 0.544; width of frontovertex, 0.172; width of mesoscutum, 0.535; length of antenna, 0.613; length of forewing, 1.09; width of forewing, 0.487 mm.

Characters taken from a large series of females and six males reared from *Pseudococcus virgatus* (Cockerell), or associated with this host, Honolulu and vicinity, Oahu, and five females from Manila and Los Banos, Philippines (George Compere, Fullaway, and H. E. Woodworth). The males were captured on September 11 and 13, 1916, on vines of the velvet bean, heavily infested with *Pseudococcus virgatus*, and on which the females of *insularis* were very abundant.

This parasite is presumably distributed throughout the lowlands of the Hawaiian Islands, although recorded specifically only from Oahu hitherto. It has been stated that it was taken by Blackburn, however, on several of the Islands, and I have seen females from Olowalu and Wailuku, Maui.

LIFE HISTORY.

Blepyrus insularis is parasitic only in *Pseudococcus virgatus* (Cockerell) so far as known. Females that were supplied with *Pseudococcus longispinus* (Targioni) oviposited rather freely, but no offspring were reared, the eggs or newly hatched

larvae presumably having been killed by the physiological reactions of the hosts. In another experiment a female was supplied with *Pseudococcus krauhniae* (Kuwana), but in this case the mealybugs were wholly ignored by the parasite.

This parasite seems always to choose first-stage larvae for oviposition, and preferably those that have recently hatched, and examines them first with her antennae. Having satisfied herself that the larva is suitable, the female turns quickly about and protrudes the ovipositor backward beneath the victim, which is punctured usually through the venter. During the process the apical part of the abdomen is extended backward and downward in a cone-shaped body. The ovipositor when protruded is slender, naked, or without external sheaths, and curved upward. The female usually places her hind tarsi on the host during oviposition, evidently partly for purposes of orientation and partly to hold it in place. The whole process of oviposition requires only about one or two seconds for completion.

Development is evidently slow, as the host itself must grow to considerable size before it is finally killed and consumed by the parasite. A female that was supplied with newly hatched *virgatus* on February 12 was observed to oviposit after a few minutes, and oviposition probably continued for several days, as on February 22 the parasite was found dead. Offspring from this reproduction began to issue on March 15 and continued to issue up to April 5, indicating a minimum length of the life-cycle of thirty-two days and a maximum of about forty-five days. The rather great range in time required is probably due to differences in the rate of the preliminary development of the host. In warmer summer weather the rate of development ought to be considerably quickened. As compared with *Pauridia peregrina* Timberlake, which has similar habits, the life-cycle is approximately the same. A female *Pauridia*, which was supplied with larvae of *Pseudococcus krauhniae* for about twenty-seven hours on January 28 and 29, oviposited freely and produced offspring which issued between February 28 and March 11, inclusive, thus indicating a minimum life-cycle of thirty-one days and a maximum of forty-three days.